Final Report

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Title: Understanding resistance to *Botrytis cinerea* in strawberries

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1. Industry Summary

The necrotrophic pathogen *Botrytis cinerea* is pervasive on UK strawberry farms and is one of the most commonly reported strawberry fungal pathogens (Calleja, 2011). UK strawberry production has increased from 35,000 tonnes in 1960 to 119,000 tonnes in 2022 (FAOSTAT, 2022), and as of yet there are no resistant strawberry varieties to *B. cinerea* (Bestfleisch *et al*., 2014; González *et al*., 2009). Currently, the most effective control methods are fungicides, however, *B. cinerea* can recurrently develop resistance to multiple fungicides (Kretschmer *et al*., 2009; Leroch *et al*., 2011). Moreover, there are negative public opinions regarding fungicide residues on food and in the environment, calling for alternative control methods to be adopted (Sutton, 1990).

This project aimed to improve our understanding of how *B. cinerea* causes disease and how strawberries can resist it. The project consisted of two main objectives:

- Identifying strawberry genes linked to resistance by infecting a mutant population of strawberry plants and sequencing those that showed more or less disease than normal.
- Discovering *B. cinerea* virulence genes by comparing the genomes of fungal isolates that varied in how aggressive they were.

Key outcomes:

- New assays were developed to measure infection on strawberry leaves, fruit, and flowers, enabling robust testing of both fungal isolates and mutant strawberry plants.
- A total of 774 strawberry genes of interest were identified, with 13 showing potential links to disease resistance.
- *B. cinerea* isolates were ranked by aggressiveness, and genes unique to the most aggressive isolates were identified.

Why this matters:

- The strawberry resistance genes discovered could help breeders develop more resistant strawberry varieties, reducing the need for fungicides.
- The fungal genes identified may act as targets for environmentally friendly control tools, such as RNA interference (RNAi) sprays.
- Farmers could benefit from reduced pre-harvest losses, while retailers and consumers would see longer shelf-life post-harvest.

This work lays the foundation for more sustainable, effective control strategies against *B. cinerea* whilst improving strawberry resistance, in order to aid the UK strawberry industry to increase yields.